

TITLE

DIFFERENTIATED RIGIDITY SWIMMING FLIPPER WITH  
HYDRODINAMICALLY DESIGNED REARWARD SHOE STRAP CONNECTION  
5 MEANS.

DESCRIPTION

Field of the Invention

The present invention relates generally to a flipper for swimmers.

10 Description of the prior art

Flippers for swimmers consist generally of a blade made of relatively rigid material connected at the rear to a shoe of relatively yielding material. In the present description the term "relatively rigid material" is to be 15 understood as referring to a material such as, for example, polypropylene or equivalent, while the term "relatively yielding material" in the present description refers to a material such as, for example, a thermoplastic polymer based essentially on SEBS elastomers or 20 equivalent.

Materials such as the ones that have just been mentioned are commonly employed for the production of flippers for swimmers.

In order to protect them against scratches and cuts 25 caused when they come into contact with reefs, stones and the like, the longitudinal edges of the rigid blade are often lined with a yielding material of the type of which the shoe is made. In a known manner, this lining is given the form of lateral ribs that generally extend both above 30 and below the plane of the blade and improve the propulsive efficacy of the flipper without increasing the overall rigidity of the blade. According to a previous

invention of the same applicant, the aforesaid lateral ribs may be made of a material having a rigidity intermediate between the rigidity of the shoe and the blade. This solution grants the designer greater freedom  
5 in the choice of the hydrodynamic and mechanical characteristics of the flipper, which are often in contrast with each other.

As is known, the efficiency of a flipper depends on the aforesaid characteristics and designers and producers  
10 of flippers therefore concentrate their attention on them, though without losing sight of the need that any modifications of the structure of a flipper intended to improve said characteristics have to be integrated in a solution that will always be aesthetically attractive and  
15 original.

In this connection it has been found that the efficiency of a flipper has a first limit in the fact that the rigid blade will generally bend only in a plane substantially at right angles to the plane of the  
20 undefomed blade, its transverse sections being maintained substantially constant.

Furthermore, it has also been found that, from a hydrodynamic point of view, the efficiency of the flipper is to some extent negatively affected by the presence of  
25 the buckles of the closing strap of the shoe, since these project sideways and constitute an obstacle to the free flow of the water along the flipper.

#### Objects and summary of the invention

It is the aim of the present invention to provide a  
30 flipper for swimmers having an improved propulsive efficiency as compared with conventional flippers for swimmers.

This aim is attained by improving the structure of the flipper from both the mechanical and the hydrodynamic point of view. In particular, elastic hinges extending in both the longitudinal and the diagonal direction have been provided on the blade of the flipper to permit also the deformation of the transverse sections of the flipper. Along the sides of the shoe, moreover, there have been provided sideways projecting fairings with thickness at least equal to that of the buckle, so that the liquid may flow above the buckle and not be negatively affected by its presence. Furthermore, with a view to limiting the encumbrance caused by the buckle to the greatest possible extent, the blade is provided with an outwardly convex hood at the connection point shaped in such a manner as to contain a connection element with which the buckle is provided to enable it to engage with an appropriately shaped opening provided on the bottom of said hood.

Brief description of the drawings

The characteristics and the advantages of the flipper for swimmers in accordance with the present invention will appear more clearly by the following description of a particular embodiment thereof, which is given by way of example and is not to be considered limitative in any way, the description making reference to the attached drawings, of which:

- Figure 1 is a top plan view of the flipper for swimmers in accordance with the invention;
- Figure 2 is a partially sideways inclined bottom view of the flipper of Figure 1;
- Figure 3 is a side elevation view of the flipper in accordance with the invention;

- Figure 4 is a perspective view of the flipper in accordance with the invention;
- Figure 5 is a perspective view of the blade of the flipper in accordance with the invention;
- 5 - Figure 6 is a perspective view of the blade of Figure 5 with lateral ribs provided along the edges of the blade;
- Figure 7 is an enlarged perspective view of the rear portion of the flipper in accordance with the invention.

Detailed description of the invention

Referring to Figures 1 to 4, the flipper in accordance with the invention comprises a blade 1 made of relatively rigid material, a shoe 2 made of relatively yielding material and two lateral ribs 3 extending along the edges of blade 1 both above and below the plane of the blade and made of a material having rigidity characteristics intermediate between those of the blade and the shoe. The flipper is produced by means of three successive moulding stages: blade 1 is the first to be moulded, the resulting product being as shown in Figure 5; the second stage consists of moulding lateral ribs 3, obtaining the product shown in Figure 6, while shoe 2 and the remaining parts of the flipper made of relatively yielding material are moulded onto the blade in a third stage.

As shown in Figures 5 and 6, the blade extends rearwards in the form two identical arms 5 delimiting a central opening 4 that substantially constitutes the seating for shoe 2, which is moulded below the plane of blade 1. Arms 5 extend with an arcuate profile to form flanks 6 containing the shoe and terminating with

respective rigid hoods 7, which are convex towards the outside and have respective butterfly-shaped openings 8 at their centre, the purpose of which will be explained further on.

5 Lateral ribs 3 are moulded along a portion of the lateral edges of blade 1 and extend along sides 6 right through to the root of their respective hoods 7.

As shown by Figure 5, blade 1 is provided with a pair of longitudinal slots 9 substantially parallel to the 10 longitudinal axis of the flipper and extending from just beyond the middle of blade 1 right through to its free edge 10. Blade 1 is also provided with two diagonal openings 11 formed at the sides of the forward end of opening 4 and diverging from the opening towards the 15 lateral edges of blade 1.

Shoe 2 is moulded onto blade 1 in the third stage of the moulding process, which simultaneously fills the two slots 9 and the two openings 11 with the same material, thereby obtaining flattened ribs 12 and 13 that jointly 20 act as elastic hinges.

The thickness of flattened ribs 12 and 13, which fill slots 9 and openings 11, is preferably greater than the thickness of rigid blade 1. In fact, flattened ribs 12 and 13 are made of a material that is less rigid than the 25 blade material and their inferior mechanical characteristics must therefore be partially compensated by means of a greater thickness. Advantageously, flattened ribs 12 and 13 arranged in slots 9 may be provided with thin longitudinal fins 14 for directioning the flow.

30 Along free edge 10 of blade 1 there is provided a wide and flattened curb 15 that closes longitudinal slots 9 of the blade. Curb 15 is made of the same material as shoe 2

and in the moulding stage is produced by means of two thin feeder channels 16 that do not interrupt the continuity of the blade and are situated in its central part, the channels being shown in Figure 1 as filled with yielding material.

The material of the shoe also covers with a partial lining 17 the parts of the lateral ribs 2 that have the greatest likelihood of being damaged by contact with such hard materials as stones, reefs and the like. Towards the free end 10 of the blade the partial lining 17 becomes joined to curb 15.

Flattened ribs 12 and 13 constitute areas of reduced rigidity on the blade with the function of acting as hinges in the truest sense of the term. Subjected to the thrust of the swimmer's foot, they permit the blade to substantially assume a concave form with substantially plane walls. In particular, in these conditions the blade assumes a trapezoidal profile in the transverse direction that has its inclined sides constituted by the portions of the blade comprised between the lateral edges and fins 14, while its shorter base is constituted by the central portion of the blade comprised between fins 14 and extending as far as the flattened diagonal ribs 13 with a profile approximately equal to the one indicated by means of the broken line in Figure 1 and indicated by means of the reference number 18.

The elastic hinges provided on the blade, constituted by ribs 12 and 13 formed in slots 9 and openings 11, enable the blade to assume a concave shape both during the power stroke and during the return stroke, when the blade encounters a lesser resistance, thus improving the overall performance of the flipper.

The lining of yielding material 17 extends along the flanks 6 of blade 1 from the lateral edges of the blade right through to the vicinity of hood 7. The cross section of lining 17 becomes considerably thicker along these flanks to generate respective fairings 19 that convey the water flow to above a pair of buckles 20 arranged at the two ends of a strap 21 that closes the shoe. Advantageously, buckle 20 will be of the so-called "fast" type, already extensively used for this application, and comprises a sheath 22 and a shutter 23, generally of three-pronged shape. According to a characteristic of the invention, sheath 22 is provided on its interior face with a head 24 having a shape equal to that of opening 8 formed on hood 7 of flanks 6 of blade 1. In Figure 7 head 24 of the buckle is shown engaged with the seating constituted by hood 7. The connection is made by bringing sheath 22 of buckle 20 into a position that is rotated through 90° with respect to its working position, inserting head 24 in opening 8 and then rotating the sheath through 90° in such a way that head 24 will bear against the walls delimiting the respective opening 8. It should be noted that, given the solution here illustrated, the buckle can tolerate an angular excursion of about ± 45° with respect to its normal working position, i.e. the one shown in Figure 7, and this makes it possible to vary the inclination of the strap by a similar amount according to the particular needs of the swimmer, thus improving the comfort of the flipper.

Openings 25 having a predominantly aesthetic function may be provided on the fairings 19.

Variations and/or modifications may be brought to the flipper for swimmers in accordance with the present

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invention without departing from the scope of the  
invention as set forth in the appended claims.

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